CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

TUBERCULOSIS INFORMATION

- Diagnosis of TB Infection and TB Disease

Diagnosis of Tuberculosis (TB) Infection (Tuberculin Skin Test)

The tuberculin skin test is used to determine whether a person is infected with *Mycobacterium tuberculosis*. Tuberculin skin testing is contraindicated only for persons who have had a necrotic reaction to a previous tuberculin skin test. It is not contraindicated for any other persons, including infants, children, pregnant women, persons who are HIV infected, or persons who have been vaccinated with BCG.

Administering the Tuberculin Skin Test

The intradermal Mantoux test should be used to determine whether a person is infected with *M. tuberculosis*. Multiple-puncture tests should not be used. The Mantoux test is the intradermal injection of 0.1 milliliters of purified protein derivative tuberculin containing 5 tuberculin units into the volar surface of the forearm. The injection should be made just beneath the surface of the skin, with the needle bevel facing upward to produce a discrete, pale elevation of the skin that is 6 millimeters to 10 millimeters in diameter.

Interpreting Skin Test Results

The reaction to the Mantoux test should be read 48 to 72 hours after the injection. The reading should be based on a measurement of induration (swelling), not on erythema, or redness. The diameter of induration should be measured perpendicularly to the long axis of the forearm. All reactions, even those classified as negative, should be recorded in millimeters.

Classification of the Tuberculin Skin Test Reaction

An induration of **5 or more millimeters** is considered positive for	An induration of **10 or more millimeters** is considered positive for	An induration of **15 or more millimeters** is considered positive for persons who do not have any risk factors for TB
- HIV-infected persons - close contacts of a person with infectious TB - persons who have abnormal chest radiographs - persons who inject drugs and whose HIV status is unknown	- foreign-born persons - HIV-negative persons who inject drugs - medically underserved, low-income populations - residents of long-term care facilities - persons with certain medical conditions***** - children <4 years old without any other risk factors - staff of long-term care facilities and health care facilities	

***** e.g., diabetes mellitus, prolonged corticosteroid therapy, immunosuppressive therapy, gastrectomy, some hematologic and reticuloendothelial diseases, end-stage renal disease, silicosis, and body weight that is 10% or more below ideal.

Some persons who have positive skin test results may have TB disease. The possibility of TB disease must be ruled out before preventive therapy is used.

False-Positive Reactions

Some persons may react to the tuberculin skin test even though they are not infected with *M. tuberculosis.* These false-positive reactions may be caused by infection with mycobacteria other than *M. tuberculosis* or by immunization with BCG.

False-Negative Reactions

Some persons may not react to the tuberculin skin test even though they are truly infected with *M. tuberculosis.* These false-negative reactions can occur in several circumstances:

- When skin testing persons who were recently infected with *M. tuberculosis*.
  These persons may have a false-negative reaction because developing an immune response to tuberculin can take 2 to 10 weeks after infection. Therefore, persons who have been exposed to someone with infectious TB disease but who have a negative reaction to the skin test should be retested 10 to 12 weeks after the exposure ends.
- When skin testing persons who were infected with *M. tuberculosis* a long time ago.
  In some persons who are infected with *M. tuberculosis*, the ability to react to tuberculin may wane over time. When given a skin test years after infection, these persons may have a negative reaction. Two-step testing is used to determine whether these persons are truly infected.
- When skin testing persons who are anergic.
  Anergy is the inability to react to skin tests because of a weakened immune system.

Two-Step Testing

In some persons who are infected with *M. tuberculosis*, the ability to react to tuberculin may wane over time. When given a skin test years after infection, these persons may have a negative reaction. However, this skin test may stimulate the immune system, causing a positive reaction to subsequent tests. This is called the booster phenomenon.

Two-step testing is used to distinguish between the booster phenomenon and new infection. If the reaction to the first test is negative, a second test is given 1 to 3 weeks later. If the reaction to the second test is positive, then it is probably a boosted reaction. Two-step testing can be useful for the initial skin testing of adults who are going to be retested periodically, such as health care workers or nursing home residents.

Anergy

Some persons may not react to the tuberculin skin test even though they are infected with *M. tuberculosis.* This may be because of anergy. Anergy is the inability to react to skin tests because of immunosuppression. Anergy is often caused by HIV infection, but it can also be caused by other medical conditions. Anergy is determined by administering two delayed-type hypersensitivity antigens, such as tetanus toxoid, mumps, or *Candida*, by the Mantoux technique. Persons who do not react to any of these antigens, including tuberculin, are probably anergic.

Interpreting Skin Test Reactions in BCG-Vaccinated Persons

In persons who have been vaccinated with BCG, it is impossible to determine whether a positive tuberculin skin test reaction is caused by immunization with BCG or by infection with *M. tuberculosis*.

However, the probability that a positive reaction is caused by infection with *M. tuberculosis* increases

(1) as the size of the reaction increases,
(2) as the length of time between vaccination and skin testing increases,

(3) when the patient has been in contact with someone who has infectious TB disease,
(4) when there is a family history of TB, or
(5) when the patient is from a country where TB is common.

BCG-vaccinated persons who have a positive reaction to the tuberculin skin test should be evaluated for preventive therapy.

Diagnosis of Tuberculosis Disease

When to Suspect Tuberculosis (TB)

Pulmonary TB disease should be suspected in persons who have fever; chills; night sweats; fatigue; loss of appetite; weight loss; a productive, prolonged cough; or hemoptysis. Persons suspected of having TB disease should be evaluated with a physical examination, a Mantoux tuberculin skin test, a chest radiograph, and a sputum smear and culture. A positive culture for *Mycobacterium tuberculosis* confirms the diagnosis of TB. However, a positive culture is not always necessary to begin or continue treatment for TB.

Persons with HIV infection and TB may have atypical chest radiographs, and they are more likely to have extrapulmonary TB than are persons without HIV infection. (However, pulmonary TB is the most common form of TB in all persons, including HIV-infected persons.) The symptoms of extrapulmonary TB depend on the site affected.

Diagnostic Laboratory Tests

The presence of acid-fast bacilli on a sputum smear often indicates TB. Acid-fast microscopy is easy and quick, but it does not confirm a diagnosis of TB because some acid-fast bacilli are not *M. tuberculosis.* Therefore, a culture is done to confirm the diagnosis. This procedure usually takes 3 to 6 weeks, but some laboratories are doing radiometric testing, which can provide results in a little as 10 days. Nucleic acid probes can identify in 2 to 8 hours mycobacteria that are grown in a pure culture. Currently, the polymerase chain reaction, or PCR, is being evaluated for its usefulness in the diagnosis of TB. PCR is not available for routine use.

Smear examinations and cultures should be done periodically to monitor the patient's response to therapy. In addition, the initial isolate from all patients should be tested for drug susceptibility. Drug susceptibility testing should be repeated if the culture results are still positive after the patient has received 3 months of therapy or if the patient does not seem to respond to therapy. Radiometric methods can be used for faster drug susceptibility testing.

For information about implementing CDC guidelines, call your state health department.

PUBLIC COMMENT - TUBERCULOSIS FAX SYSTEM

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

For a limited time CDC is accepting public comment on the information services you used. We are particularly interested in the areas listed below. If you wish to comment, you may:

FAX this sheet with your comments to: CDC-VIS/FAX (404) 639-1733, or
Mail to: CDC, IRMO MS C-15, 1600 Clifton Road, N.E., Atlanta, GA 30333

1. You are
   ____ health care professional
   ____ other

2. Fax sheet(s) you received:
   ____ Tuberculosis (TB): General Information
   ____ TB Infection vs. TB Disease
   ____ Diagnosis of TB Infection (Tuberculin Skin Test) and TB Disease
   ____ Treatment of TB Infection (Preventive Therapy)
   ____ Treatment of TB Disease
   ____ Management of Persons Exposed to Multidrug-Resistant TB
   ____ BCG Vaccine
   ____ Infection Control
   ____ Screening for TB
   ____ TB Morbidity in the United States
   ____ Tuberculosis Educational Materials Order Form

3. Reason you requested fax sheet:
   ____ for general information on topic
   ____ to answer specific question

   If you had a specific question, please describe it:

4. The information met your needs.
   ____ yes
   ____ no
   ____ partially

   If you answered no or partially, please describe your unmet needs:

5. Suggestions for additional information sheets or for improving the system: